ERT

Document P-2858
February 15, 1977

Final environmental impact report on the removal of incineration service from the medical area total energy plant

ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.
CONCORD, MASS • CHICAGO • LOS ANGELES • WASHINGTON D C

ERT

Document P-2858
February 15, 1977

Final environmental impact report on the removal of incineration service from the medical area total energy plant

ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.
CONCORD MASS • CHICAGO • LOS ANGELES • WASHINGTON D.C.

Gov Doc
Plate only

TABLE OF CONTENTS

1. SUMMARY SHEETS

Proposed Action

Approval is sought from the Boston Redevelopment Authority for amendments to the Chapter 121A application in connection with the Medical Area Total Energy Plant, ("MATEP"), an urban redevelopment project previously approved by the Boston Redevelopment Authority and designed to provide members of Medical Area Service Corporation ("MASCO") with steam, electricity, chilled water and incinerator service. Specifically, the proposed action consists of (1) eliminating solid waste incineration from plans for the Total Energy Plant, and (2) eliminating plans for a pneumatic solid waste collection system which would have sent solid waste from medical area institutions directly to the central incinerator via a system of underground 20-inch diameter pneumatic pipes.

Identification Number

EOEA No. 01540.

Agency Which Prepared This Report

This environmental impact report has been submitted by the Boston Redevelopment Authority and the Department of Environmental Quality Engineering.

Date of Submittal

This environmental impact report was submitted to the Executive Office of Environmental Affairs on February 15, 1977. It will become available to the public when notice of its availability will be published in the Environmental Monitor on or about February 22, 1977.

Status of This Report

This report has been filed as a Final Environmental Impact Report for the proposed action.

Consequences of the Proposed Action

The prime results of eliminating the incineration system from the Total Energy Plant would be that fewer air contaminants would be released from the plant and that current means of removing solid waste from the medical area institutions would have to be continued. Since ambient concentrations of particulates have exceeded air quality standards in the greater Boston area, avoiding emissions from this non-essential source would be beneficial.

If central incineration is not used, impacts associated with the way in which trash is currently removed would continue. Since it is likely that trash quantities will increase in the future, associated impacts will also increase. Surveys performed by Charles G. Hilgenhurst and Associates, United Engineers & Constructors, Inc. and Environmental Research & Technology have shown that present methods of collection and removal do not place a significant burden on the environmental quality in the medical area of Boston. Trash storage containers are generally in areas away from the public, and good housekeeping practices control odors, rodents, flies and litter. ERT has estimated, that up to eight trash trucks currently travel to and from the medical area each day. This number may increase to 15 per day by the year 1990. The number of trucks is a small fraction of the traffic on major roadways leading to and from the medical area, and the time of operation in the medical area is brief. Loading operations at a dumpster or compactor container is on the average not greater than five to ten minutes. Some of the trucks are very noisy during the loading operations and disturb the institutional activities near the storage containers. It is not believed that the trucks contribute significantly to ambient air quality levels, and during a brief period of measurement for carbon monoxide the effects of two types of trash trucks were not measurable.

Potential improvements that could be made to the way in which trash is currently removed have been reviewed. Although the determination of how to improve the existing removal system will be outside the scope of MATEP with the removal of the incinerator process, MASCO is uniquely suited to coordinate the improvement of existing conventional efforts with a view toward meaningful economics.

The alternative to the proposed action is the installation of a central incineration system. Since incineration of hospital wastes would increase air contaminant emissions and could cause problems due to the combustion of plastics, this alternative is not desirable. Incineration would also not eliminate the need for trash trucks operating in the medical area since current analysis has shown that storage containers and trash trucks would still be required to remove wastes that could not be conveyed to the Total Energy Plant.

2. INTRODUCTION

Medical Area Total Energy Plant, Inc., the urban redevelopment corporation formed pursuant to the approvals of the Boston Redevelopment Authority (the "BRA") for the construction, operation, and maintenance of the Medical Area Total Energy Plant, and the original applicants, including Medical Area Service Corporation and President and Fellows of Harvard College, have recently filed with the BRA amendments to the application seeking approval of certain project changes. The amendment to the 121A application includes a proposal to remove central plant refuse collection and incineration from the MATEP concept. The purpose of this report is to evaluate the environmental impacts associated with this proposed action in accordance with the Massachusetts Environmental Policy Act, GL Chapter 30, Sections 61 and 62.

The objective of the Total Energy Plant has been to provide an efficient and reliable means of generating utility service (steam, electricity, chilled water) for the associated Medical Area users. The concept of central plant refuse collection and incineration was added subsequently to provide an additional centralized service for the users and to take advantage of apparent economic benefits to be gained from recovering heat from the incineration process. The conceptual design for the plant, including incineration, is described in the 121 application (approved December 8, 1975) and the Environmental Impact Report (approved January 23, 1976).

In May of 1976, correspondence from the Department of Environmental Quality Engineering established the fact that decreasing particulate emissions in the Boston area was a matter of high priority. Shortly thereafter, United Engineers & Constructors, Inc. was selected to complete the design and construction of the plant. One of UE&C's first tasks was to take all practical means to minimize emissions from the essential sources within the plant and to eliminate all nonessential sources of particulate emissions. This effort resulted in the installation of electrostatic precipitators on the steam boilers (at a cost of

$1,500,000) and afterburners for the diesel engine exhaust (at a cost of $1,200,000). The next step was to re-examine the concept of refuse incineration in light of the need to reduce particulates. The following conclusions resulted:

- Removal of the incinerator would reduce particulate emissions from the plant.
- Questions of reliability related to the central collection system indicate that the service might be a disadvantage to the users rather than an advantage.
- Refined engineering data demonstrate that there is an economic penalty associated with the concept, rather than the previously expected economic benefit.
- Removal of the central collection and incineration concept would not result in any significant environmental impacts.

3. DESCRIPTION OF THE PROPOSED ACTION

Medical Area Total Energy Plant, Inc., the urban redevelopment corporation, and the original applicants have proposed amendments to the 121A application which describes the Total Energy Plant to be built in Boston on a block bounded by Binney and Francis Streets and Brookline Avenue. The amendment consists of eliminating central incineration and the associated pneumatic trash conveyance system from the Total Energy Plant.

3.1 Description of Incineration System that would be Eliminated

The incineration and pneumatic trash conveyance system has been described in the Final Environmental Impact Report which was submitted to the Executive Office of Environmental Affairs on September 29, 1975. The incineration system was originally planned primarily to serve the members of MASCO by way of a penumatic trash conveyance system. While this report noted that solid waste from the Mission Park Housing Development would be included, no provision for conveyance of this waste to the incinerator was made. Furthermore, plans for the housing (Final Environmental Impact Report for Mission Park, Boston, Massachusetts, January 30, 1975) were based upon a conventional truck pickup and land-fill disposal approach to handle solid waste. According to the property manager, approximately 1.5 to 2 tons of waste per day are anticipated.* This waste will be removed via compactor (packer) trucks to the West Roxbury landfill, requiring two or three truck trips per week. The housing development is being built without provisions for an automatic waste collection system. The original concept of incineration and conveyance is briefly described below.

Two 20 ton per day incinerators were to be installed each having the capacity to handle the institutions' load during a 17-hour period. The incinerators were to be used only for general refuse. They were to be designed with a dumping grate and refractory furnace operating with 200 to 300 percent excess air. Flue gas temperatures were expected to

*Telephone interview with Mr. John Redman of Leggat, McCall & Werner, February 14, 1977.

be about 800°F before entering heat recovery boilers. The heat recovery boilers were to have been used after the incinerators, each with a capacity to produce approximately 7,000 lb of steam/hr at 185 psig to recover as much heat as possible from this operation.

Operation of each incinerator would have been on a batch basis as a measure to achieve complete combustion. No. 6 residual oil was planned to be used as an auxiliary fuel at a rate of about 100 gallons per hour. The flue gases were to be used as partial combustion air for two of the steam boilers which were expected to act as afterburners and eliminate any odors. Multicyclone type of particulate collectors were proposed to remove particulate matter from the flue gas before the flue gas went to the heat recovery boilers and steam boilers. Ash collected in the cyclones was to be reintroduced into the incinerator. It was expected that all ash from the incineration process could have been removed from the Total Energy Plant once a week in a 30 ton capacity truck.

Trash was to be conveyed to the Total Energy Plant by a pneumatic system which would have been connected to each member of MASCO. The pneumatic system would have been placed in the distribution tunnel which would have carried the steam, chilled water and electricity to the MASCO members.

The recent engineering reevaluation and redesign of the concept of incineration by United Engineers & Constructors, Inc. has determined that the incineration system would have to be different from that presented in the Final Environmental Impact Report if it were to be included in the Total Energy Plant. This more recent design is described in Section 6 of this report as the alternative to eliminating incineration from the Total Energy Plant.

3.2 Modifications of Characteristics of the Total Energy Plant Resulting from the Proposed Action

Eliminating the pneumatic conveyance and incineration system will not change the original purpose of the Total Energy Plant or significantly alter external aspects of the project. As originally planned, the incineration would have provided approximately 3 percent of the heat required for two of the boilers and would have provided about 0.7 percent of the peak hourly steam generation capability of the Total Energy

Plant. Removal of incineration would require additional heat to be supplied to account for the heat that would not be available from incinerators. This would require approximately 500,000 gallons of fuel oil per year which is about 2% of the annual fuel consumption for the total plant. However, handling the low pressure steam and controlling the exhaust gases to the steam boilers from the incinerators would have created more problems than the savings in heat would have warranted.

Some of these problems include the following:

1) The generated low-pressure steam would not be available for production of by-product electric power as would the other steam produced in the plant.

2) The incineration operation would serve as an uncontrolled source of low-pressure steam which would create disturbances in the operation of the other steam processes; i.e., the back-pressure and extraction turbines. This would complicate control functions within the plant.

3) The use of incinerator exhaust gas, with its variable oxygen quantities, as combustion air for the package steam boilers would greatly complicate the combustion control system.

4) The unknown composition of the incinerator exhaust gas would have a potential for adverse effect on the maintenance and lifetime of the package steam boilers.

Removal of the incineration system will reduce emissions of sulfur dioxide, nitrogen oxides and particulates (as shown in Table 5.2-1 of this report) that would have resulted from solid waste incineration. Air contaminants associated with combustion of plastics will also be avoided by elimination of incineration.

Removal of the incineration system will allow some of the rooftop equipment that would have been associated with the incineration system to be eliminated. This will improve the rooftop appearance. In addition, the space made available by removal of incineration equipment can be used to advantage for laying out other pieces of equipment within the Total Energy Plant.

Operating and maintenance personnel and power requirements necessary for incineration would also be eliminated. Plant reliability would be enhanced because the potential for hazardous combustible materials to enter the Total Energy Plant would be avoided.

Other aspects of the Total Energy Plant such as noise generation, water usage or truck traffic to the Total Energy Plant will not be significantly affected by removal of the incineration system. Any impacts associated with the incineration system will decrease with its elimination.

Removal of the incineration system will mean that the Total Energy Plant will not have the capability to burn solid waste.

3.3 Implications on Solid Waste Collection Resulting from the Proposed Action

Elimination of the incineration and pneumatic trash conveying system from the Total Energy Plant would require that MASCO members and the Mission Park Housing Development use other methods to remove their solid waste from the area. Therefore, waste removal is an indirect aspect of the proposed action. The immediate result of the proposed action will be the continuation of the existing trash removal system as described in Section 4 of this report. Section 5 reviews the environment impacts of various methods of removing the wastes. MASCO will review the various methods with a view toward meaningful economics.

4. DESCRIPTION OF THE ENVIRONMENT LIKELY TO BE INFLUENCED BY THE PROPOSED ACTION

4.1 Description of the Area

The area which would most directly be influenced by eliminating the pneumatic waste conveying system and the incineration capability from the Medical Area Total Energy Plant is shown in Figure 4-1. This area is bounded by the Riverway, the Fenway and Huntington Avenue. This area consists primarily of institutional uses with residential uses in the area bounded by Huntington Avenue, Francis Street and the Riverway.

This area which is referred to as the medical area has been described in the Final Environmental Impact Report for the Medical Area Total Energy Plant, which was submitted to the Executive Office of Environmental Affairs September 29, 1975.

Since September 29, 1975 several projects have either been completed or are in the final stages of construction, and other projects have begun. These are listed below.

- Site preparation and foundation installation for the Total Energy Plant
- Closing of Peabody Street as part of preparation for the Total Energy Plant
- Site preparation for construction of the Affiliated Hospitals Center
- Mission Park Housing - 774 units of mixed income housing, 42,000 sq. ft. of commercial space, and an underground garage
- Sidney Farber Cancer Center - 150 bed cancer research and treatment facility with a 600 person staff in addition to a 200 car institutional garage

Figure 4-1 Medical Area

- Joslin Howard F. Root Wing - Addition of a 4-story patient and research facility with commercial footage along Brookline Avenue.
- New England Deaconess Hospital Radiation Facility - laboratory with seven stories above grade, five below
- Rehabilitated Housing - Harvard University has upgraded housing units which it owns
- Children's Hospital Entrance Pavillion
- Beth Israel Feldberg Addition - This facility has 176 beds
- Boston State Library - 12-story addition containing a cafeteria, library and educational facilities
- New England Deaconess School of Nursing - an 8-story building which provides educational and residential facilities for 200 student nurses.

4.2 Description of Existing Trash Disposal Practices

In order to obtain an indication of the environmental conditions associated with the current solid waste handling, storage, and removal practices of MASCO members, a series of site inspections were performed on November 17 and 19, 1976 by a representative of Environmental Research & Technology, Inc. Individuals responsible for disposal of solid waste at each institution were contacted either by telephone or in person. The scope of this survey was confined to general solid waste not requiring special handling such as garbage, bottles, cans, paper, plastics, dirt and animal litter. Wastes of a hazardous nature requiring special handling, such as biological and radiological materials, were not considered in this survey, since these wastes are handled separately.

Information on the existing waste handling situation was also derived from a survey prepared by Charles G. Hilgenhurst and Associates on September 24, 1976, and from a solid waste disposal study prepared by United Engineers & Constructors, Inc. in November 1976.

Information obtained from these surveys consists of (1) a physical description of the individual waste systems, and (2) a qualitative assessment of environmental conditions.

Storage Facilities

Locations of the existing solid waste storage and removal locations used by the various institutions within the vicinity of the MASCO area are shown in Figure 4-2. The solid waste is stored, prior to removal by contractors, in either standard open steel bins, dumpsters, typically of 3 to 6 cubic yard capacity or larger container-compactor units of 10 to 40 cubic yard capacity. In a few instances, plastic bags are stored in building areas. A listing of the location and type of waste storage facilities at each of the MASCO member institutions is presented in Table 4-1.

In general, waste storage containers are in areas normally not frequented either by the public or by employees (other than these connected with waste removal operations). Such areas are typically loading docks and alleys. Some of the waste container units are located in parking lots and other areas traversed infrequently by the public or by employees. The land uses noted in the vicinity of the waste container units were exclusively institutional.

Solid waste is manually collected from within the institutions and brought to centralized storage facilities by hand carts of approximately 1 to 2 yard capacities. The general routing of these carts is from waste generation areas, down service elevators, and along 1st floor or basement corridors to the storage point. This may entail considerable outside travel in some cases. For example, Peter Bent Brigham removes trash from the House of the Good Samaritan and also some office space within the Children's Inn, and transports it, via hand cart, to a single storage-compactor unit located at a loading dock area off of Shattuck Street.

Waste Disposal

Four different private contractors presently service MASCO member institutions and each institution has its own contract. Approximately 90 percent of the total weight of waste disposed of is handled by two

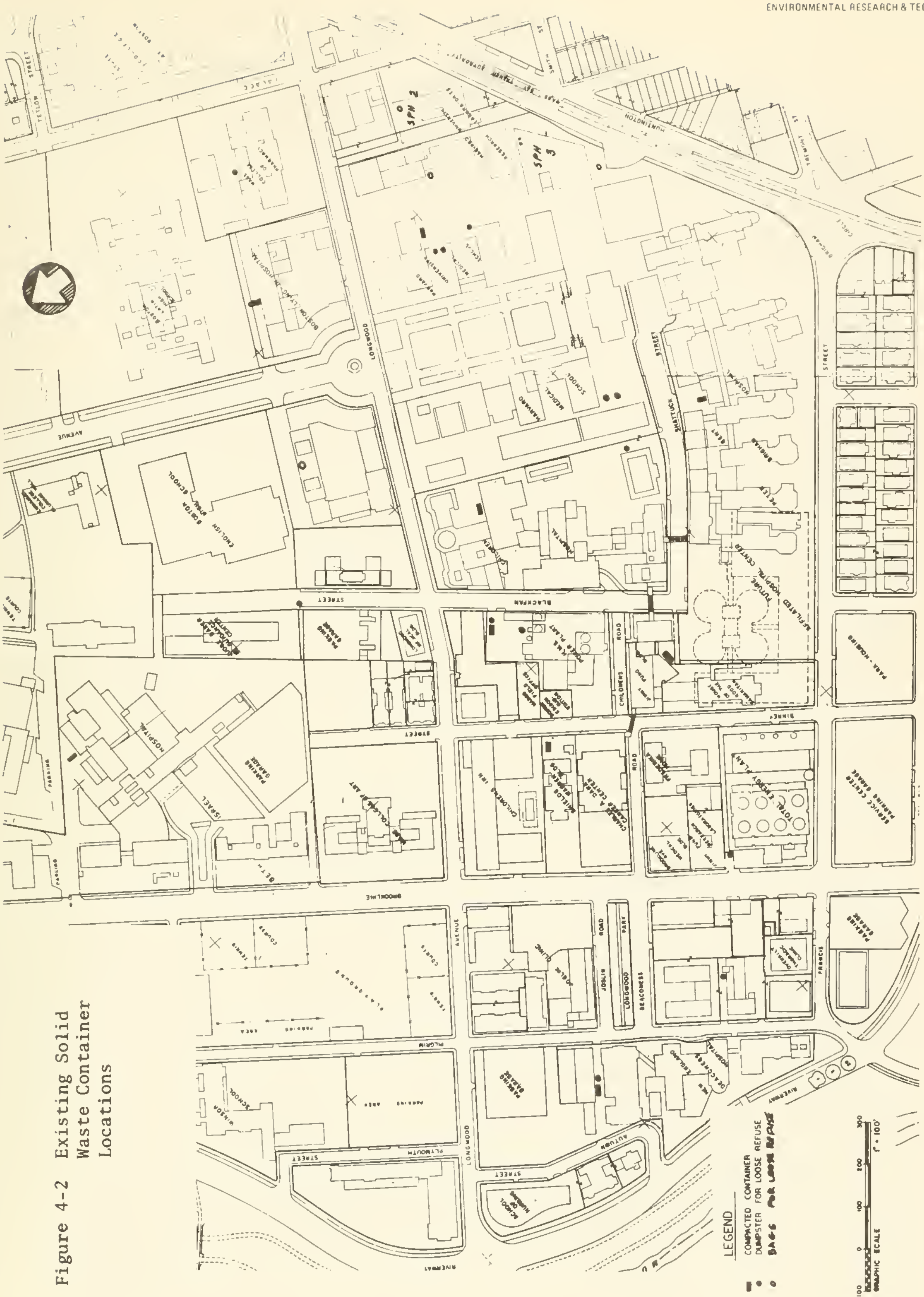

Figure 4-2 Existing Solid Waste Container Locations

Figure 4-2 Existing Solid Waste Container Locations

firms. Of the total weekly volume of trash removed, approximately 1,300 yards, 1,000 yards is compacted and stored on site. The remaining 300 yards are stored uncompacted and are removed by compactor trucks. In terms of weight, the percentage of trash compacted during storage is approximately 90 percent of the total trash. Pickup of waste occurs at a range of times during the day, with a concentration of pickups in the 7-9 AM time period. No pickups are made on Sunday.

On-site compaction is accomplished by an electric motor-hydraulic pump and piston unit which is installed at an institution's trash storage site. A portable enclosed steel box (roll off container) to receive the compacted trash is mated with the compactor unit. This box is removed by the contractor, either on a regular schedule or on a call basis. This box is disconnected from the compactor and pulled by a winch and cable mechanism onto the roll-off truck. This loading operation is relatively brief, lasting 5 to 10 minutes depending on accessibility of the truck to the storage point. The contractor then removes the compacted waste to one of the municipal or private waste disposal facilities currently being used in the Boston Metropolitan area.

Within a period of one-half to one-hour, the contractor returns with an empty container and unloads and mates the empty container with the compactor unit. The operation of unloading an empty box takes about the same amount of time as the removal of a filled box.

Loose trash stored in either plastic bags or open dumpster containers is picked up by compactor trucks and compacted at the time of pickup. In the case of containers, these are tipped into the receiving end of the truck (hopper), inverted, emptied, and then tipped back to their original position at the site. Bagged material is thrown by hand into the truck's hopper. A power take off driven hydraulic system operates the truck's integral compactor system which packs the loose trash tightly into the body of the truck. The trash removal time for the dumpster storage system is roughly the same as for the on-site compaction system, varying from five to 10 minutes depending on container size, type of waste in the container and ease of access to the container.

Quantities of Wastes

The quantity of wastes presented in the Final Environmental Impact Report were based on data then available to the Design Engineer. This information indicated that an incinerator with a capacity of 20 tons per day could dispose of trash from the MASCO member institutions by operating 17 hours per day, six days a week. These figures translate into a capability of burning 4,420 tons of trash per year.

As the design of the Total Energy Plant has continued, additional efforts have been made to define the wastes which must be removed from the institutions. Tonnage and volume of wastes generated have been difficult to define because method of compacting, density of compacted material and daily quantities of waste produced are not consistent throughout the MASCO member institutions. Estimates of wastes made by United Engineers & Constructors, Inc. were based on weekly tonnage data by Beth Israel Hospital, Peter Bent Brigham Hospital and Children's Hospital Medical Center, estimates of employee and patient populations, and data from the Harvard University Medical School. These estimates have indicated that about 26 tons of waste are collected per day. Based on six day weeks this is an annual weight of waste of 8,112 tons.

Based on a similar survey of waste disposal practices by MASCO members and the type and size of containers used by the institutions and the frequency of pickups, ERT estimates that the current weight trash produced could be about 28 tons per day, equivalent to 8,740 tons per year. The ranges of estimates of waste tonnages are shown in Table 4-2. The current estimates and future projections of waste tonnages have not included wastes from the Mission Park Housing Development.

Several factors exist, which will result in significant increases in the rates of solid waste generation in medical area. One factor is the growing use of disposable medical and other supplies by medical area institutions. The other is growth in institutional size, due to recent construction of new facilities and expansion of medical services. An analysis of these factors by UE&C indicates that the medical area solid waste generation will increase in 1980 over the current rate by approximately 40 percent and by 1990 by approximately 80 percent. A comparison of estimates of daily and annual waste production rates and the estimated 1980 and 1990 rates is presented in Table 4-2.

Truck Trips

The annual number of trash truck trips presented in the Final Environmental Impact Report was estimated by MASCO to be approximately 5,200 trips or an average of 100 trips per week. This value for annual trips was based upon an extrapolation approach using number of trips and trash removal service cost data for one member institution and the total costs for all MASCO members waste removal service. Since the automated collection system as originally conceived would have eliminated reliance upon trash trucks, a more accurate estimate of the number of trash trucks was not considered necessary for the Final Environmental Impact Report. Since the proposed action would cause reliance on trash trucks to continue, ERT has attempted to reevaluate the numbers of trash trucks that are being used.

The results of the recent ERT survey of MASCO solid waste removal, a survey conducted by C. Hilgenhurst and Associates, and estimated by UE&C indicate that there is presently a range of 35 to 50 truck trips per week (one trip corresponds to a truck entering and leaving the medical area) or approximately 1,820 to 2,600 trips per year. These results are shown in Table 4-2. This information was based upon direct observation of existing waste collection methods and current pickup schedules, which are presented in Appendix A. Review of the trash pickup schedule, presented in Table 4-1, indicates that the daily number of truck trips is relatively constant over six days of the week. Since one contractor handles most of the wastes, it is reasonable that truck trips would be evenly spread throughout the week so that the contractor's fleet of trucks would be used effectively. (No pickups are performed on Sunday.) Therefore, it is believed that an average of eight truck trips per day represents the upper level of current trash truck activity in the medical area. Future increases in solid waste could increase the daily average number of trips to 15 trucks per day in 1990.

The same factors used to project future solid waste generation were used to project numbers of trash trucks.

TABLE 4-1

SUMMARY OF MASCO MEMBERS' SOLID WASTE STORAGE AND REMOVAL APPROACHES

	Storage Characteristics			Removal Characteristics(9)		
Institution	Location	Container Type5	Container Size (Cubic Yards)	Frequency Days	Weekly Total Pickups	Time Of Pickup
N. E. Deaconess	Alley connecting Autumn St. & Joslin Road	C	40	Once a day (Mon. - Sat.)	6	9 AM
	Autumn St. & Joslin Road	D	8	On Call } Typically twice a week pickup	2 (9)	-
	Alley Next to Cancer Research Building	D	8	On Call		-
Joslin Clinic	---None(1)---					
Beth Israel	On Emergency Entrance Road Northeast side of property	C	35	Three times (MWF) & On Call (Tue.)	3 to 4	7 - 9 AM
Sidney Farber Cancer Inst.						
Jimmy Fund Bldg.		C	10	Once a day (Mon-Sat)	6	7 - 8 AM
C. A. Dana Bldg.		C	30	Once every 2 days6	3	Morning Afternoon or Evening
Redstone Bldg.	(2)	D	6	Once a day (Mon-Sat)	5 (2)	-
Peter Bent Brigham	Shattuck St.	C	30	Once a day	6	11 - 1 PM
Children's Hospital	300 Longwood	C	40	Once every 2 days & on call (Tue., Thur., Sat.)	3 - 4	7 AM
	Enders	C	30	On Call	1	-
	Enders	D	6	Once a day	6	6 - 7 AM
	Judge Baker(3)	D	6	On Call } Typically once a week pickup	1 (9)	-
	Garage	D	6	On Call		-
	55 Shattuck	D	6	On Call		-
Mass College of Pharmacy	Loading Dock (rear (rear of White Bldg.)	D	10(4)	Twice a week (Wed & Sat)	2	2 - 3 PM Wed. 8 - 9 AM Sat.
Boston Hospital for Women (BLI)	Rear of Hospital (NE wall)	C	30	Once every two days (Mon., Wed., Fri.)	3	9 - 10 AM
Harvard Medical School	Medical School Pkg. Lot	C	40	Once a week	1	Midday
	Medical School Pkg. Lot	D	3(7)	Once a day	6(9)	Midday
	Medical School Pkg. Lot	D	6	Once a day		
	Dental School	B	2(8)	Once a day		
	SPH #2	B	15(8)	Once a day		
	SPH # 2 Kresge	D	4(7)	Once a day		
	Countway	B	10(8)	Once a day		
	LHRRB	D	6(7)	Once a day		
	Vanderbilt	B	15(8)	Once a day		

Footnotes on next page.

FOOTNOTES FOR TABLE 4-1

1) Joslin Clinic has an arrangement with N. E. Deaconess wherein they use the Deaconess 40 yard compactor unit. Furthermore, Joslin did not make plans for a conventional (compactor or dumpster) pickup facility in the design of their new facility which is almost completed.

2) The Redstone building is not completely operational and plans for solid waste disposal have not been made yet. A best estimate was used for near term future storage and removal characteristics was used to complete this table.

3) Children's Hospital occupies space in the Judge Baker Guidance Center Building and uses a dumpster there, but Children's is not responsible for disposal of this waste.

4) This waste consists of compacted bags loaded into a dumpster unit. This particular bag compactor results in a 6:1 compaction factor on loose waste material.

5) Three types of solid waste storage containers are used by MASCO member institutions; "C" denotes on-site compactor and storage box, "D" denotes open steel box or dumpster and "B" denotes plastic bagged trash.

6) Pick-up not regularly scheduled but "on call" basis.

7) Two identical units, each of the indicated capacity, are generally at this location.

8) Cubic yards of loose waste were determined from numbers of bags by using an estimate of 2 bags per cubic yard.

9) Refer to Appendix A, page 40 for proceedure used to estimate trash truck trips. Note, a single contractor and compactor truck service N.E. Deaconess Hospital, Children's Hospital and Harvard Medical Schools, making a single daily loop truck trip.

TABLE 4-2

ESTIMATED FUTURE SOLID WASTE

	Estimate Contained in the Final EIR	Current Estimates by United Engineers & Constructors, Inc.	Current Estimates by Charles Hilgenhurst and Associates	Current Estimates by Environmental Research & Technology, Inc.	Estimates for Future Years* 1980**	Estimates for Future Years* 1990**
TONNAGES						
Tons/day	14	26	--	28	39	50
Tons/year	4,420	8,112	--	8,740	12,325	15,630
TRUCK COLLECTION TRIPS						
Trips/week	100	38	35 to 40	45 to 50	63-70	80-89
Average Trips/year	5,200	1,976	1,820 to 2,080	2,340 to 2,600	3,500	4,400

*Based upon ERT estimates of present truck trips and UE&C derived projection factors for increases in solid waste generation in future years.

**Based upon current estimates of tonnages and projection factors for increases in solid waste generation in future years derived by UE&C.

5. ENVIRONMENTAL IMPACTS OF REMOVING THE CENTRAL INCINERATION SYSTEM

This section of the report discusses the proposed action as it relates to regional solid waste disposal and impacts from the Total Energy Plant. The impacts which may occur as various methods are used to remove wastes from the medical area of Boston have also been addressed. Since several approaches may be used to remove the wastes, each approach is discussed separately.

5.1 Regional Solid Waste Disposal Considerations

Elimination of waste incineration from the Total Energy Plant would be consistent with the direction of current long range planning efforts in the area of regional solid waste disposal. A number of governmental agencies such as the U.S. Environmental Protection Agency,[a] the Massachusetts Bureau of Solid Waste,[b] (now part of the Massachusetts Department of Environmental Management) and Boston Department of Public Works[c] have either issued regulations or policy statements emphasizing the critical need for regional cooperation and use of large scale resource recovery facilities as the best long range approach to solid waste disposal. Such facilities are currently being studied by Boston's DPW. A large scale for such facilities is considered important to be able to achieve satisfactory rates of energy and materials recovery and to establish attractive capital and operating economics. This does not

---

[a]The wording in the "Resource Conservation and Recovery Act of 1976," promulgated October 21, 1976 suggests that the Federal government will be placing a series of increasingly tougher standards on landfill operations (in terms of controlling dust emissions and leachates for example).

[b]The director of the Bureau of Solid Waste, in interpreting the results of a State sponsored A. D. Little study of resource recovery for the state, indicated that the state favors a strong involvement of the private sector with the regional resource recovery approach: "We believe that private industry, with its technology and financing ability, has got to get into resource recovery for it to be successful." Boston Evening Globe, March 31, 1974 page 38.

[c]Personal communication with Boston's Commissioner of the Department of Public Works, Joseph F. Casazza, on November 12, 1976.

preclude the fact that incineration and heat recovery at smaller facilities may also be consistent with regional solid waste disposal plans; however, the trend appears to favor larger scale facilities.

The proposed action of not constructing a small scale incinerator will mean that the existing disposal approach of using landfills will continue to be used. However, within the next 10 years it is possible that MASCO solid waste will be disposed of in a high efficiency regional level resource recovery facility.

At present, approximately 80 percent of the solid waste generated by MASCO members is disposed of in the recently opened commercial sanitary landfill in Plainville, Massachusetts, 10 percent is disposed of in the Saugus commercial incinerator and the remaining 10 percent is disposed of in Boston's Gardiner Street landfill operation. The Plainville landfill has a ten year lifetime at the current design fill rate of 750 tons per day.* Current disposal practices therefore represent a small reliance on the city's limited capacity landfill operation and do not appear to have any negative short-term problems.

5.2 Impacts from the Total Energy Plant

The prime effect of eliminating the incineration system from the Total Energy Plant is avoiding the emission of air contaminants that would be associated with incineration. Table 5.2-1 lists emissions which would be avoided by eliminating the incineration. A wide range of estimates of emissions is contained in Table 5.2-1 because it contains those emissions due to incineration as presented in the Final Environmental Impact Report and emissions from an incineration system that would be installed based on current designs if incineration were to be included in the Total Energy Plant.

An incinerator at the Total Energy Plant emitting particulates at a rate of 1.4 lb per ton of refuse would emit 2.3 lb of particulates per hour based on burning 28 tons of waste during a 17 hour day. Based on calculations of particulate contributions to ambient air quality presented in the Final Environmental Impact Report these emissions would be

*Per information supplied February 11, 1977, by Mr. Paul Anderson, DEQE regional engineer. MASCO's average daily contribution (28 tons x 0.8) represents about 3% of the design fill rate at the Plainville landfill.

TABLE 5.2-1

EMISSIONS OF AIR CONTAMINANTS THAT WOULD BE AVOIDED IF INCINERATION WERE ELIMINATED FROM THE TOTAL ENERGY PLANT[a]

Emission Rates and Emissions as Presented in the Final[b] Environmental Impact Report

	lb/ton of refuse	lb/hour based on burning 14 tons during a 17 hour period	lb/year based on burning 4,470 tons
SO_2	2.5	2.0	12,410
NO_2	2	1.6	9,930
Particulates			
with no collection equipment	15	12.4	76,942
with a cyclone having collection efficiency of 50%	7.5	6.2	38,471

Emission Rates and Emissions Based on Current Designs of an Incinerator System[c]

	lb/ton of refuse	lb/hour based on burning 39 tons during a 17 hour period[d]	lb/year based on burning 12,325 tons[d]
SO_2	1.5	3.4	18,488
NO_2	10	22.9	123,250
Particulates			
with secondary chamber after burning and no additional collection equipment	1.4	3.2	17,255
with a cyclone having collection efficiency of 42%	0.81	1.9	9,983
with a scrubber having a collection efficiency of 80%	0.28	0.6	3,451
with an electrostatic precipitator having a collection efficiency of 86%	0.20	0.5	2,465
Carbon Monoxide	negligible	negligible	negligible

[a] Supplement No. 5 for Compilation of Air Pollutant Emission Factor-Second Edition, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, December 1975.

[b] Emissions factors are based on industrial/commercial single chamber incinerators

[c] Emission factors are based on controlled air incinerators

[d] Solid waste tonnages are based on estimates for the year 1980. It has been assumed that all solid waste generated would be burned.

Note: Emissions of other contaminants such as organic acids associated with incineration have not been included since they are dependent upon types and quantities of materials burned.

responsible for peak 24-hour concentration of 0.15 $\mu g/m^3$ and a peak annual concentration of 0.009 $\mu g/m^3$. (The applicable 24-hour and annual particulate air quality standards are 150 $\mu g/m^3$ and 60 $\mu g/m^3$, respectively.) Since the greater Boston area is considered by the Department of Environmental Quality Engineering to be a nonattainment area for particulates, avoiding particulate emissions would be beneficial.

In addition, since a variety of plastic materials may be contained within the institutional wastes that were to be burned, organic acids may have been formed in the incineration process. Elimination of incineration would avoid any problems that may be associated with the burning of plastics.

5.3 Effects on the Environment of Continuing to Use the Existing Waste Collection System

The following paragraphs describe some of the environmental conditions associated with the storage and truck transport of MASCO member solid waste. In terms of impacts upon people, several factors should be considered. First, as noted previously the storage containers are typically located in out of the way areas, such as loading docks, so that they are removed from the general public and from people in the institutions. Second, the truck operations associated with waste removal are relatively brief, lasting from 5 to 10 minutes, depending primarily on the accessability of the storage container to the removal truck. Third, trash truck activities are generally in areas where other trucks are working.

General Conditions Near Storage Containers

During a brief survey, conducted in November 1976, ERT found that the environmental conditions near waste storage containers to be generally excellent. Only in one or two instances was some local litter observed and this was confined to an area within a few feet of the storage container. In one instance, a smelly liquid was observed leaking from a compactor unit and running into a nearby storm drain.

A number of MASCO member organizations have specific, written, guidelines for the internal collection of waste, and the maintenance of the waste storage area. These procedures include regular disinfection

of hand carts and storage equipment as well as sweeping and washing the storage area after the contractor removes the storage container.* In several instances the implementation of these procedures was observed. The establishment and application of these procedures is an important aspect of preventing insect and rodent problems.

Noise Conditions

Noise levels associated with trash trucks are a function of the type of truck, its mode of operation and the distance to receptors. There are two types of trash truck serving the medical area: the roll off container truck and the compactor truck, each of which spends some time at waste storage areas and some time traveling within the medical area. The pickup of dumpster and bagged waste by compactor type trucks is a relatively noisy operation. Operation of the truck's loader-compactor generated a noise level of 85 dBA at a distance of approximately 50 feet from the truck. Noise levels of this amount are sufficient to preclude ordinary speech communication and would be found sufficiently annoying by most people, to cause them to avoid the area of the loading operation.

Unloading a large compactor unit is a much quieter operation. Noise levels at 50 feet of approximately 70 to 75 dBA were measured. The operation of the compactor unit itself is quiet: levels of 75 dBA and less at 5 feet from the compactor and were measured at a number of different units.**

The roll off and compactor trucks observed operating within the medical area are diesel powered vehicles, which produce street noise levels varying from 76 to 91 dBA (at a reference distance of twenty-five feet), depending on whether the truck is idling or undergoing acceleration. Thus, the highest noise levels experienced by pedestrians, occurs during the relatively brief period when a trash truck passes.

*Telephone conversations with some waste removal contractors revealed that these contractors wash and sterilize the containers during the warm weather months.

**Noise levels inside a (highly reverberant) loading room for one compactor unit measured approximately 85 dBA. However, this represents an occupational health consideration rather than an exterior environmental effect.

Traffic Congestion

It is not believed that the current method of removing wastes from the medical area is a significant contributor to traffic congestion which occurs in the medical area. This is because the average daily number of trash trucks is about eight. Traffic volumes in the area were determined by Wilbur Smith and Associates and presented in the Final EIR. Comparison of total traffic volumes to trash truck trips indicates that 12 trash trucks (in the year 1980) would be a small percentage of current traffic volumes. For example traffic volumes during the peak morning hours on streets in the area have been measured as follows:

Brookline Avenue	- 1,500 vehicles per hour
Longwood Avenue	- 888 vehicles per hour
Huntington Avenue	- 1,400 vehicles per hour
Binney Street	- 300 vehicles per hour
Francis Street	- 620 vehicles per hour

While turning movements of trash trucks can cause a momentary traffic delay by blocking traffic flow as it waits to turn, the small number of trash trucks that serve the institutions are not considered to be a significant source of traffic congestion. Some trash trucks that serve the institutions have been observed to operate during the morning rush hour and several pickups are scheduled for that period. If any problem of early morning traffic congestion occurs the truck movements could be rescheduled. No trash removal is scheduled for the late afternoon when traffic congestion is greatest.

The storage facilities which must be emptied are located off of private roads, parking lots, alleys and loading docks of institutions. Therefore, operation of waste pickup would not generally block through roads used by the public. Illegally parked employee vehicles and delivery trucks interfere with the movements of the trash trucks by blocking access to the storage containers. Trash trucks maneuvering into position to empty storage containers may block movements of vehicles in the streets among the institutions. The time to load a trash container is approximately 5 to 10 minutes. Figures 5-1 and 5-2 show parking situations near some of the storage containers.

Figure 5-1   Trash Removal and the Parking Situation

Figure 5-2 Trash Removal and the Parking Situation

No consideration has been given to truck traffic relative to the Mission Park Housing Development since it is now planned that wastes will be collected at several points within that development and transferred by truck out of the area for disposal.

Air Quality

Trash trucks are a source of air contaminants, primarily carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO_x). Nitrogen oxides and hydrocarbons (nonmethane) are potentially hazardous through their ability to react in the presence of sunlight, producing photochemical oxidants. However, since this is a process which requires considerable time, and hence, occurs over downwind transport distances on the order of several miles, these pollutants are ordinarily addressed in a regional, rather than local, analysis of air quality impact. The effects of carbon monoxide, on the other hand, are most pronounced at close distances from the source and are, therefore, evaluated locally. The low number of trash trucks in relation to total vehicles in the area makes the trash trucks minor contributors to the overall level of air quality both on a local and regional basis. For comparison purposes Table 5-2 presents contaminant emission rates for heavy duty diesel trucks and light duty vehicles. This table shows that carbon monoxide emissions are lower from a diesel truck than from a light duty vehicle while the reverse is true for nitrogen oxides.

Since the number of vehicles in the area during the peak morning hour is high, the contribution from eight diesel trash trucks, if they were all there at the same time, would be low. For example, if the 1500 cars on Brookline Avenue were traveling at 20 miles per hour, the total CO emission rate would be 64,380 grams per mile. Twelve trash trucks at the same speed would be emitting CO at a rate of 303 grams per mile. This would be about 0.5 percent of the current total carbon monoxide emitted. It should be recognized that the traffic in the areas in the peak morning hour is greater than the 1500 vehicles measured on Brookline Avenue, and the percentage contribution of air contaminants emitted from trash trucks that serve the institution is considerably less.

TABLE 5-2

EMISSIONS FROM LIGHT AND HEAVY DUTY MOTOR VEHICLES

Emissions from Light Duty Vehicles (grams/mile)[a]

	15 mph	20 mph	25 mph	30 mph
Carbon Monoxide	56.19	42.92	33.80	27.44
Hycrocarbons	5.27	4.33	3.66	3.18
Nitrogen Oxides	3.60	3.75	3.90	4.05
Particulates (from exhaust)	0.34	0.34	0.34	0.34

Emissions from Heavy Duty Diesel Vehicles (grams/mile)[b]

	15 mph	20 mph	25 mph	30 mph
Carbon Monoxide	28.99	25.26	19.52	15.50
Hydrocarbons	4.83	4.28	3.68	3.26
Nitrogen Oxides	21.53	21.95	23.83	25.08
Particulates (from exhaust)	1.3	1.3	1.3	1.3

[a]Emissions for light duty vehicles are based on a composite car in 1977

[b]Emissions for heavy duty diesel vehicles are based on a composite truck prior to 1973

Source: Preliminary Edition of Supplement 5 to Compilation of Air Pollutant Emission Factors, AP-42, U. S. Environmental Protection Agency, 1975

ERT conducted a brief carbon monoxide (CO) measurement program on December 20, 1976* to see if carbon monoxide concentrations from a trash truck are significant. Since the measurement program was brief, the results cannot be extrapolated to cover effects of trash truck operation at all times. However, the measurements did show that background levels were low and that no effect of trash truck operation could be seen.

Carbon monoxide levels were measured in the vicinity of trash storage containers for a period of time before, during, and after trash truck servicing of both dumpster and roll-off containers. Wind speeds ranged from calm to about 5 mph and the instrument was moved to a range of distances (30 feet to 3 feet) downwind of the trucks in order to detect maximum CO concentrations. The measurement results indicated that the operation of the diesel trash trucks did not result in measurable increases in local CO concentrations. During the measurement period, between 6:30 am to 11:30 am, background CO concentrations ranged between 4 to 8 ppm, with transient peaks to 17 ppm resulting from pre-1976 automobiles.

The hourly carbon monoxide concentrations and even the peak momentary concentrations are well within the National Ambient Air Quality Standard of 35 ppm for maximum one-hour CO concentrations. Although this field measurement data and Table 5-2 data cannot be used to say that the CO standards are not exceeded in the area, it does indicate that the contribution from trash trucks is negligible.

5.4 Effects on the Environment of Unifying the Existing Waste Collection System

A change to the existing waste collection system could be accomplished by placing solid waste collection under the centralized control. This would allow for certain modifications to be made to the existing waste collection system:

*An Ecolyzer 2600 CO Analyzer was used in this study. It was calibrated with N.B.S. referenced gas before and after the study. The final calibration showed no change from the initial calibration.

Housekeeping Practices

At present some of the MASCO member institutions have excellent housekeeping procedures associated with the exterior storage and removal operations for solid waste. These procedures are in the form of specific written descriptions, covering topics ranging from when certain floors are picked up to the disinfection of containers. It may be feasible to standardize these procedures and have them followed by all of the member institutions.

Optimizing Pickup Schedules and Storage Containers

Since there is a variety of types and sizes of storage containers, inefficiencies in trash storage and removal may exist. It is possible that review of the waste storage facilities could enable fewer but larger compactor units to serve the area. This would result in the need for fewer pickups and use of the quieter container trucks. Even though trash truck traffic and associated problems are not considered to be significant, a reduction in trash truck traffic would be beneficial.

5.5 Effects on the Environment of Using Light Duty Collection Vehicles and a Central Transfer Facility

This system could consist of a collection scheme based upon use of light duty propane gas or electric powered tow vehicles which would collect loose (non-compacted) solid wastes. These vehicles would move within the medical area, supplying empty waste containers to institutions and removing filled containers. These containers would consist of small rubber tired trailers of approximately, 3 to 5 cubic yard capacity. A central transfer facility would be required were these containers to be emptied and automatically cleaned prior to returning to use. This central facility could compact the waste either with or without shreading and transfer the waste to large haulage trucks for removal from the area.

This approach would have the advantages of:

- providing quiet, non-air polluting collection within the medical area.

- reducing truck trips to and from the medical area.
- eliminating large storage containers within the medical area.
- removing wastes from the institutions on a frequent basis.

On the other hand it would increase the activity of trash collection vehicles within the medical area and would require a special site, including adequate space to handle large vehicles, storage of waste and transfer equipment.

5.6 Effects on the Environment of Using an Automated Collection System

The objectives of an automated central waste collection system would be to consolidate the waste collection operations in the area, and provide a clean, safe, and reliable method for conveying these wastes to a central location for processing and final disposal. The basic concept of such systems involves use of the utility distribution tunnels linking the MASCO member institutions with the Total Energy Plant.

Automatic collection systems have the following common advantages over conventional surface collection approaches since they would:

- produce no noise
- produce no air contaminants
- produce no traffic congestion
- produce no litter or other external sanitation or visual problems

Potential systems which were considered for this project included:

1) Centeralized Cart System
2) Mechanical Conveyors
3) Pneumatic Systems

A study of these systems by UE&C indicates that the following particular disadvantages exist:

Centralized Cart System Disadvantages

1) The cart system would require a substantially larger utility tunnel. In addition, large amounts of space would have to be provided at each institution and at a central location for cart storage, washing, and repair.

2) The installed cost for the system hardware alone would exceed 1.6 million dollars exclusive of the additional tunnel costs.

3) The system would be open and would present a potential fire hazard, an attraction for vermin, and would be subject to vandalism.

4) Cart systems have not yet been installed on a scale similar to the medical area. In those cases where systems have been installed, they have not been found to be an efficient and economical method for handling solid wastes alone.

Mechanical Conveyor System Disadvantages

1) Use of a belt conveyor for unclassified and nonhomogenious waste would require a minimum belt width of two feet. The approximate cost for such a conveyor installed could run as high as $500 per linear foot. A system consisting of some 5000 linear feet could cost $2,500,000 for the conveyor alone.

2) A belt conveyor installation would require a substantially larger utility tunnel. Space would have to be provided throughout the extent of the system to provide complete access to the conveyor for maintenance. Some piping could be run overhead; however, it would be physically impossible to run the large chilled water and steam lines in a tunnel similar in size to those presently being considered for the utilities distribution.

3) The belt conveyor would have to be enclosed, ventilated, and made rodentproof. In addition, the conveyor would require sprinklers along its entire length for fire protection.

Pneumatic System Disadvantages

1) The central collection system cannot be designed to handle all of the non-hazardous waste presently generated at the hospitals. Based on comparison of sizes of municipal wastes, it is possible that up to one-fourth of the daily tonnage of wastes may be unconveyable. Therefore, the installation of the system would not eliminate the need for all of refuse storage facilities which is presently in use. The amount of space allocated internally to waste disposal at each institution would be increased by the addition of the loading stations for each user, and this would result in an added housekeeping requirement.

2) The pneumatic system is subject to failure which historically is the result of human error, since operation of the system would require a certain level of competence.

3) There is no way of insuring that a pneumatic transport system would not suffer blockages. At best, one can only assume that these blockages may only require minimal system downtime of 3 to 4 hours.

4) The system would attempt to convey any object that is placed into its charging hopper. Therefore, it is possible that combustible and perhaps explosive material could, inadvertently or by sabotage, enter the system. These materials do not pose a significant problem to the transport system due to the fact that combustion could not take place during transport. There is a risk factor which would have to be considered if the material were to be transported to the power plant.

5) The system does not offer any reduction in labor for handling of solid wastes for the majority of its users. The exception to this is Affiliated Hospitals Center which has incorporated a central collection system as part of its design. Normally a vacuum system is installed to reduce labor costs by eliminating or minimizing vertical and horizontal transport of waste within a complex or high-rise building. By extending the

system to each floor or by interfacing the system with gravity chutes, it becomes advantageous to install a central system and reduce the manual handling and labor costs. For a few users, such as Children's Hospital and the Harvard Medical School, a system with only a single bulk loading station per user would definitely mean additional cost for sorting conveyable and unconveyable wastes and for hauling the conveyable waste through each complex to a single removal point.

6) From conversations with owners of pneumatic trash systems conducted by UE&C, ratings of the reliability have ranged from poor to excellent. In the cases where pneumatic conveying was endorsed, the owners did point out that initially there were "numerous problems" which had to be worked out of the system. In one case, two years was cited as the actual elapsed time period before the system performed to their satisfaction.

7) Due to the high daily waste load, the peak loading requirement and the limited number of refuse charging stations, it could become necessary to schedule system time for use by the institutions. Scheduling would limit institutional access to the system and may require alteration of housekeeping routines. The only exception to this would be the Affiliated Hospitals Center which must operate on a demand basis from a level sensor in their gravity chutes. A build-up of waste above the preset level in the chute would increase the potential for clogging and could result in malfunction of the chute system.

6. ALTERNATIVE TO THE PROPOSED ACTION

If the proposed action of eliminating the incineration system from the Total Energy Plant is not taken, the alternative action is to include an incineration system as originally planned. However, the system would be based on the more recent designs prepared by United Engineers & Constructors, Inc. This section describes this system, aspects of maintenance and operating, and environmental effects.

Description of the Central Collection System

The central collection system would be designed to convey general hospital wastes to the Total Energy Plant. It would consist of a network of transfer piping located underground in utility tunnels for conveying the solid waste from the institutions to the central plant where it would be separated from the conveying air stream and metered to the incinerators.

Each institution would be provided with a floor mounted loading station comprised of a loading hopper, air inlet valve, and material discharge valve.

Once deposited in the hopper the refuse would be allowed to accumulate above a discharge valve prior to being released into the conveying air stream.

The system would be automatically controlled from a central panel. Initiation of a collection cycle would occur on a scheduled basis every 15 minutes. Once a cycle is initiated, the exhauster would be started, the air inlet valve would be opened, and air flow would be established in the conveying pipe. The discharge valve would then open allowing the refuse to fall into the negatively pressurized 20 inch conveying pipe. This cycle would be repeated in sequence until all loading stations have been emptied.

From each collection point, the waste would be conveyed in a high velocity air stream through the pipe to cyclones located at the central plant. The wastes would be separated from the air stream in each cyclone which would be equipped with a slide gate airlock. Between collection cycles, the cyclones would automatically discharge through the slide

gates into shredders for size reduction. The waste would then be conveyed to the surge storage hopper and material would be metered to the incinerators.

From the cyclones the conveying air would be filtered and discharged to the atmosphere through sound attenuators.

Description of the Incineration System

Three oil fired controlled air incinerators would be provided, each capable of burning 2,500 pounds per hour of wastes comprised of hospital trash and garbage. Each incinerator would be complete with a ram charging system to facilitate loading of the waste materials. Waste from the storage hopper would be conveyed to each incinerator ram feed hopper. Once loaded in the hopper, the operating sequence and burning cycle would be entirely automated.

Following a short preheating period, the lower chamber or ignition chamber would be charged with the waste material. Exhaust gases and unburned particles would be directed into the second combustion chamber which would be provided with a second burner to complete the combustion process on all burnable waste and exhaust products. Sulfur dioxide, nitrogen oxides and particulates would be formed during the combustion of the wastes. While sulfur dioxide emissions cannot readily be controlled, the two stage combustion is designed to reduce formation of nitrogen oxides and particulates.

In this current design of the incineration system, separate heat recovery boilers would be used, and exhaust gases would then go directly to the stack rather than into the package steam boilers.

The sterile residue resulting from the process would be removed automatically from each incinerator, deposited in a quenching hopper, and conveyed to storage in a small portable container located below the incinerator room for daily removal from the Total Energy Plant.

Risk Aspects of Maintenance and Operation of Incineration and Conveying System

Incinerators have a history of unreliable operation. Any installation requires a backup or standby in the event of equipment failure. There

equipment failure. There are safety hazards present during the daily operation. Medicines, empty alcohol containers, or any trash saturated with flammable liquids could accidently enter the system due to human error. Large amounts of these materials could go undetected due to the automated nature of the conveying and feed system. These materials could pose a potential risk to the incinerator, its operators, and the Total Energy Plant.

Other aspects of maintaining and operating an automated conveyance system have been presented in Section 5.6 of this report.

Air Contaminant Emissions from Incineration

The incineration of wastes at the Total Energy Plant would result primarily in emissions of sulfur dioxide, nitrogen oxides and particulates. Quantities of SO_2 are primarily a function of sulfur contained in the wastes. NO_2 and particulates are more dependent upon the type of incinerator and method of operation. Organic acids may also be created when certain plastics are burned. This is dependent upon the characteristics of the wastes to be incinerated.

Air contaminant emissions from a multiple chamber and controlled in industrial/commercial incinerator are listed in Table 6-1. It would be desirable to eliminate these emissions since the greater Boston area is considered to be a non-attainment area for particulates by the Department of Environmental Quality Engineering and organic acids may be released due to the presence of plastics.

Changes in Waste Collection

While the central incineration system would be able to dispose of all general hospital wastes, the reduction is dependent upon the quantity of wastes which can be safely passed through the pneumatic piping system.

The proportion of waste which a pneumatic system can handle is related to the particle size distribution in the waste and the design of the piping system. An estimate by UE&C is that up to 25 percent of the general hospital wastes would be nonconveyable, based upon a 20 inch diameter pipe system design. Thus, alternate approaches for the collection and disposal of this nonconveyable trash would be required. One

TABLE 6-1

EMISSION RATES AND EMISSIONS BASED ON CURRENT DESIGNS OF INCINERATOR SYSTEM

Controlled Air Industrial/Commercial Incinerator	lb/ton of Refuse	lb/hour Based on Burning 39 Tons During a 17 Hour period[a]	lb/year Based on Burning 12,325 tons[a]
SO_2	1.5	3.4	18,488
NO_2	10.0	22.9	123,250
Particulates			
with secondary combustion and no additional collection equipment	1.4	3.2	17,255
with a cyclone having collection efficiency of 42%	0.81	1.9	9,983
with a scrubber having a collection efficiency of 80%	0.28	0.6	3,451
with an electrostatic precipitator having a collection efficiency of 86%	0.20	0.5	2,465
Carbon Monoxide	negligible	negligible	negligible

Source: Supplement No. 5 for Compilation of Air Pollutant Emissions Factor-Second Edition, U. S. Environmental Protection Agency, Research Triangle Park, North Carolina, December 1975.

[a]Solid waste tonnages are based on estimates for the year 1980. It has been assumed that all solid waste generated would be burned. However, up to 25 percent of the wastes might still have to be disposed of in other ways since they may not be able to be conveyed to the incinerator. Thus, all quantities of emissions might be reduced by 25 percent.

NOTE: Emissions of other contaminants such as organic acids associated with incineration have not been included since they are dependent upon types and quantities of materials burned.

approach would be to employ either hand carts or light duty shuttle vehicles to collect this trach and bring it to the Total Energy Plant for incineration. Another approach would be to continue, with less frequent pickups, essentially the existing trash collection and disposal system for the nonconveyable wastes.

Changes in Waste Collection Impacts

The environmental impacts of the existing waste collection system were described in Section 5.3. The impacts consist of air contaminant emissions from up to 14 trash trips per day (by the year 1990), brief periods of high truck noise levels, and rare instances of litter near waste storage containers. These relatively minor impacts would be reduced or practically eliminated by using a pneumatic trash collection system. Use of light duty (electric or propane powered) shuttle vehicles or hand carts for the collection and removal to the central incinerator of the general waste which is too large for the pneumatic system, would essentially eliminate most environmental impacts associated with waste collection.

In Section 5.1 it was observed that existing waste disposal practices do not have any appreciable negative short-term impacts on the regional waste disposal system. Thus, changes causing a reduction in the waste quantities sent to regional facilities would not be important. On a long term basis, the pneumatic collection and incineration system is believed to be at cross purposes with current regional solid waste planning efforts. Regional waste disposal in the future, will emphasize large scale resource recovery facilities excluding local, small scale, less efficient disposal approaches.

7. MEASURES TO MINIMIZE IMPACTS

Impacts resulting from the proposed action can be minimized by planning and coordinating the waste removal from the medical area institutions. Review of storage equipment, compactors, locations and sizes of containers, schedules of pickups and enforcement of parking restrictions near storage containers would minimize any problems that occur due to the existing method of waste disposal. The use of roll-off containers allows quieter trucks to be used. If compactor trucks are used, extra muffling could be added. Enforcement of traffic regulations in the medical area would allow the trash trucks to manuever easier and be out of the area faster.

In addition to streamlining the waste removal, efforts could be instituted to reduce the quantity of waste generated. Centralized warehousing and separating trash within each institution could decrease the amount of waste that would have to be removed. Centralized sterilization equipment would also allow disposable items to be replaced with reuseables.

Thus, even though the existing waste situation could be continued without creating environmental damage, there are ways to improve it.

APPENDIX A

PROCEDURE USED TO ESTIMATE CURRENT NUMBER OF TRASH TRUCK TRIPS

APPENDIX A

PROCEDURE USED TO ESTIMATE CURRENT NUMBER OF TRASH TRUCK TRIPS

Section 4 of this report presented a range of 45 to 50 trash truck trips per week. This appendix shows how these numbers were obtained.

For each roll off container listed in Table A-1, an average number of pickups per week was obtained from housekeeping personnel or the waste collection contractor. For most of the 9 roll-off containers now in use, the collection contractor can remove a filled container on one leg of his trip and bring an empty back on the return leg. In the case of Beth Israel Hospital the contractor indicated using another trip to bring an empty container back. Thus 3.5 trips are added to the 33 pick-up operations to obtain 36.5 truck trips per week to service the roll-off containers.

TABLE A-1

Hospital	Roll-Off Container Size (cu yds)	Average Number of Pickups per Week
Deaconess	40	6
Beth Israel	35	3.5
Jimmy Fund	10	6
Dana Building	30	3
Brigham	30	6
Childrens	40	3.5
Childrens	30	1
Boston Hosp. for Women	30	3
H. Med. Schools	40	1
Total Pickups		33
Beth Israel return trips		3.5
Total Truck trips to service roll-off containers		36.5

Collection of loose waste stored in dumpsters and bags is accomplished by compactor trucks. While the number of loose waste pickups (63) represents approximately twice the number roll-off container pickups, fewer truck trips are required. This is because much less trash is at each pickup point and one truck can therefore make multiple pickups during one trip.* Two contractors currently make such pickups in the medical area; one makes daily pickups (6 days) and the other makes pickups twice a week. Thus, 6 + 2 = 8 trips week are now used to pickup loose waste. The number of weekly trash truck trips is therefor the sum of trips to service roll-off containers (36.5) and loose waste containers (8) for a total of approximately 45 truck trips.

The Redstone Building is currently in the final stages of renovation. When it becomes operational it is expected to require 5 to 6 pickups per week and may use a different contractor than those currently making loose waste pickups. Therefore another 5 truck trips may be required in the near future, for a total of 50 truck trips per week.

*A compactor truck can typically hold 5 tons of waste. The loose waste collected each day from the medical area is approximately 3.5 tons.

ERT

ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.

Corporate Headquarters	696 Virginia Road, Concord, Massachusetts 01742, (617) 369-8910, 489-3750
Eastern Technical Center	696 Virginia Road, Concord, Massachusetts 01742, (617) 369-8910, 489-3750
	3 Militia Drive, Lexington, Massachusetts 02173, (617) 861-6400
Midwestern Technical Center	131 Eisenhower Lane, Chicago (Lombard), Illinois 60148, (312) 620-5900
Rocky Mtn. Technical Center	Box 2105, 1716 Heath Pkwy, Ft. Collins, CO. 80522, (303) 493-8890, (Denver) 534-8201
Western Technical Center	741 Lakefield Road, Westlake Village, California 91360, (805) 495-4683
	2030 Alameda Padre Serra, Santa Barbara, California 93103, (805) 966-6126
Mid-Atlantic Regional Office	11583 Embers Court, Reston, Virginia 22091, (703) 860-0080
Southeastern Regional Office	296 Interstate North, Suite 110, Atlanta, Georgia 30339, (404) 955-3121
Gulf Regional Office	5100 Westheimer, Suite 250, Houston, Texas 77056, (713) 960-1422
Washington, D.C. Office	1730 Rhode Island Avenue N W , Washington, D.C. 20036, (202) 296-0071
Billings Office	Box 1415, Granite Tower Building, Billings, Montana 59103, (406) 252-2184
Puerto Rico Office	P O Box 29007, Rio Piedras, Puerto Rico 00929, (809) 769-9507, 9509
ERT International, Inc.	696 Virginia Road Concord Massachusetts 01742, (617) 369-8910
Ecology Consultants, Inc.	P.O Box 2105, 1716 Heath Parkway Fort Collins, Colorado 80522, (303) 493-8878